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1 Communication Apparatus for Selecting a
Communication Protocol Compatible to a Partner
Station and Executing the Selected Protocol

5 BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to a communication apparatus which selects a communication protocol compatible to a partner station and executing the selected protocol.

Related Background Art

In prior art apparatus of this type, a facsimile apparatus has been known. The communication protocol of the facsimile apparatus includes G1, G2, G3 and G4 protocols. The G4 protocol uses a digital line and the G1, G2 and G3 protocols use an analog public line. In connecting a line to a communication partner station, the facsimile apparatus sequentially sends the G3 protocol, the G2 protocol and the G1 protocol and determines which protocol is to be executed in accordance with the presence or absence of acknowledge signals to the respective sent signals.

However, in the above facsimile apparatus, the G3 protocol, the G2 protocol and the G1 protocol are sequentially sent and the presence or absence of the acknowledge signal thereto is checked. Accordingly, a long time is required before the communication protocol

1 to be executed is determined.

When a new communication protocol is added to the above protocols, a longer time is required before the communication protocol is determined. Where
5 signals are to be sent and received to and from the partner station, if the reception of the signal is unsuccessful, a protocol of a lower function is selected even if the partner station actually has a protocol of a higher function.

10 Information on the communication function of the partner station may be registered, together with a telephone number of the partner station, in a one-touch dial key or an abbreviated dial key. Thus, when a call is made by depressing the dial key, the
15 communication mode is selected in accordance with the registered information of the communication function (USP 4,910,506).

However, in the above USP 4,910,506, the information of the communication function registered
20 in the one touch key is not useful for a received call.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide an improved communication apparatus in the
25 light of the above problems.

It is another object of the present invention to provide a communication apparatus which can rapidly

- 1 determine a proper communication protocol at the reception of a call in accordance with a partner or calling station.

Other objects of the present invention will
5 be apparent from the following detailed description
and drawings of the preferred embodiments.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is composed of Figs. 1A and 1B and

10 ^ shows a block diagram of a configuration of a facsimile apparatus of an embodiment
^ is a flow chart of the control steps
Fig. 2 shows a flow chart of control of a control circuit 54 of Fig. 1B,
is a flow chart of the control steps
Fig. 3 shows a flow chart of control of the control circuit 54 of Fig. 1B,
is a flow chart of the control steps
Fig. 4 shows a flow chart of control of the control circuit 54 of Fig. 1B,
is a flow chart of the control steps
Fig. 5 shows a flow chart of control of the control circuit 54 of Fig. 1B,
is a flow chart of the control steps
Fig. 6 shows a flow chart of control of the control circuit 54 of Fig. 1B,
is a flow chart of the control steps
Fig. 7 shows a flow chart of control of the control circuit 54 of Fig. 1B, and
is a flow chart of the control steps
Fig. 8 shows a flow chart of control of the control circuit 54 of Fig. 1B.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

1 [Embodiment 1]

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Figs. 1A and 1B ^{comprise} show a block diagram of an embodiment of a facsimile apparatus of the present invention.

5 In Figs. 1A and 1B, numeral 2 denotes a CML relay which connects a telephone line (signal lines 2a, 2b) to a facsimile communication unit (signal lines 14a, 14b) when a signal level '1' is outputted to a signal line 54a, and connects the telephone line 10 (signal lines 2a, 2b) to a telephone set (signal lines 10a, 10b) when a signal level '0' is outputted to the signal line 54a.

15 Numeral 4 denotes a TEL relay for detecting non-ringing call reception and an off-hook state during communication. It connects signal lines 6a, 6b to the signal lines 10a, 10b when the signal level '1' is outputted to a signal line 54b, and connects the signal lines 6a, 6b to signal lines 8a, 8b when the signal level '0' is outputted to the signal line 54b. When 20 the signal level '0' is outputted to the signal line 54b, an off-hook detection circuit 8 determines whether the telephone set is in the off-hook state or not, and if it is in the off-hook state, it outputs the signal level '0' to a signal line 8c.

25 Numeral 6 denotes a telephone set.

Numeral 10 denotes a call signal detection circuit which receives the signals on the signal lines

1 10a and 10b, and outputs the signal level '1' to the
signal line 10a when it detects a call signal and
outputs the signal level '0' to the signal line 10a
when it does not detect the call signal.

5 Numeral 12 denotes a circuit for detecting
telephone number information sent between the call
signals. It outputs the detected telephone number
information to a signal line 12a.

10 Numeral 14 denotes a hybrid circuit for
separating a transmission signal from a reception
signal. Namely, the transmission signal on a signal
line 30a is sent to the telephone line through signal
lines 14a, 14b and the CML relay 2. A signal sent
from ^{the} other station is outputted to a signal line 14c
15 through the CML relay 2 and the signal lines 14a, 14b.

20 Numeral 16 denotes a modulator for modulating
a signal in accordance with the CCITT Recommendation
V.21. The modulator 16 receives a protocol signal on
a signal line 54c, modulates it and outputs the
modulated data to a signal line 16a.

25 Numeral 18 denotes a modulator for modulating
a signal in accordance with the CCITT Recommendation
V.8. The modulator 18 receives a protocol signal on a
signal line 54d, modulates it and outputs the modulated
data to a signal line 18a.

 Numeral 20 denotes a Q-PSK modulator for a
protocol between image transmission pages by using a

1 V.34 high speed modem. The modulator 20 receives a
protocol signal on the signal line 54e, modulates it
and outputs the modulated data to a signal line 20a.

Numeral 22 denotes a read circuit which
5 sequentially reads one line of image signal along a
main scan direction from a transmission document sheet
to generate a signal train representing black and
white binary signals. It comprises an image pickup
device such as a CCD (charge coupled device) and an
10 optical system. The black and white binary signal
train is outputted to a signal line 22a.

Numeral 24 denotes an encoder which receives
the read data outputted to the signal line 22a and
outputs encoded data (MH (modified Huffmann) encoded,
15 MR (modified READ) encoded or MMR (modified modified
READ) encoded data) to a signal line 24a.

Numeral 26 denotes a modulator which modulates
a signal in accordance with the known CCITT
Recommendation V.27 ter (differential phase modulation),
20 V.29 (quadrature modulation) or V.17. The modulator
26 receives the signal on the signal line 24a when the
signal level '1' is outputted to a signal line 54f,
modulates it and outputs the modulated data to a signal
line 26a. The modulator 26 does nothing when the
25 signal level '0' is outputted to the signal line 54f.

Numeral 28 denotes a modulator which modulates
a signal in accordance with the CCITT Recommendation

1 V.34. When the signal level '1' is outputted to a
signal line 54g, the modulator 28 receives the signal
on the signal line 24a, modulates it and outputs the
modulated data to a signal line 28a. The modulator 28
5 does nothing when the signal level '0' is outputted to
the signal line 54g.

Numeral 30 denotes an adder circuit which
receives the signals on the signal lines 16a, 18a, 20a,
26a and 28a and outputs a sum signal to a signal line
10 30a.

Numeral 32 denotes a demodulator which
demodulates a signal in accordance with the known
CCITT Recommendation V.21. The demodulator 32 receives
the signal on a signal line 14c, demodulates it and
15 outputs the demodulated data to a signal line 32a.

Numeral 34 denotes a demodulator which
demodulates a signal in accordance with the CCITT
Recommendation V.8. The demodulator 34 receives the
signal on the signal line 14c, demodulates it and
20 outputs the demodulated data to a signal line 34a.

Numeral 36 denotes a Q·PSK demodulator for the
protocol between image transmission pages using the
CCITT Recommendation V.34 high speed modem. The
demodulator 36 receives the signal on the signal line
25 14c, Q·PSK demodulates it and outputs the demodulated
data to a signal line 36a.

Numeral 38 denotes a demodulator which

1 demodulates a signal in accordance with the known
CCITT Recommendation V.27 ter (phase difference
modulation), V.29 (quadrature modulation) or V.17.
5 The demodulator 38 receives the signal on the signal
line 14c, demodulates it and outputs the demodulated
data to a signal line 38a.

Numeral 40 denotes a demodulator which
demodulates a signal in accordance with the CCITT
Recommendation V.34. The demodulator 40 receives the
10 signal on the signal line 14c, demodulates it and
outputs the demodulated data to a signal line 40a.

Numeral 42 denotes a decoder circuit which
receives the signal outputted to the signal line 38a
when the signal level '0' is outputted to a signal
15 line 54h, receives the signal outputted to the signal
line 40a when the signal level '1' is outputted to the
signal line 54h, and outputs encoded data (MH
(modified Huffmann) encoded, MR (modified READ)
encoded or MMR (modified modified READ) encoded data)
20 to a signal line 42a.

Numeral 44 denotes a record circuit which
receives the data outputted to the signal line 42a and
sequentially records it one line at a time.

A Numeral 46 denotes ^a circuit which stores
25 communication systems (particularly, the communication
systems in accordance with V.21, V.27 ter, V.29 and
V.17 or the communication systems in accordance with

1 V.8 and V.34) in association with a telephone number of
a transmit station (copartner or calling station) sent
between call signals.

Numeral 48 denotes a circuit which stores the
5 data of registration of the communication system
through a signal line 48a in association with the
telephone number of the calling station sent between
call signals.

Numeral 50 denotes a circuit which counts the
10 number of times of communication (reception) after the
registration of the communication system through a
signal line 50a in association with the telephone
number of the calling station sent between call
signals.

15 Numeral 52 denotes a console unit having a
registration button used to store the communication
system in association with the telephone number of the
calling station sent between call signals, a ten-key,
one-touch dial keys, abbreviation dial keys, a sent
20 key, a start key and other function keys. The
information corresponding to the depressed key is
outputted to a signal line 52a.

Numeral 54 denotes a control circuit which,
in the facsimile apparatus capable of detecting the
25 telephone number information sent between call signals,
^{the information of the}
has means for storing _A the communication system for
the calling station in accordance with the telephone

1 number information and call signal detection means and
primarily controls the start of the communication by
the stored communication system in accordance with
the telephone number information sent between call
5 signals when the call signal is detected. The
communication systems may be the communication systems
based on V.21, V.27 ter, V.29 and V.17 or the communica-
cation systems based on V.8 and V.34.

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1 to the signal line 54h to set a state in which decoder
circuit 42 receives the signal on the signal line 40a.

In a step S72, whether the registration of the communication system in association with the telephone
5 number between call signals has been selected or not is determined, and if the registration has been selected, the process proceeds to a step S74 to register the communication system (the first communication system based on V.21, V.27 ter, V.29 and V.17
10 or the second communication system based on V.8 and V.34) in association with the telephone number of the call signal to the circuit 46, and if the registration has not been selected, the process proceeds to a step S76.

15 In the step S76, the information on the signal line 10a is received and whether the call signal has been detected or not is determined. If the call signal has been detected, the process proceeds to a step S80, and if the call signal has not been detected,
20 the process proceeds to a step S78 to execute other processes
processes.
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In the step S80, the information of the circuit 46 is checked to determine whether the telephone number between call signals is for the first communication system based on V.21, V.27 ter, V.29 and V.17,
25 and if it is for the first communication system based on V.21, V.27 ter, V.29 and V.17, the process proceeds

1 to a step S82, and if it is for the second communication
system based on V.8 and V.34, the process proceeds to
a step S96.

In the step S82, the signal level '1' is
5 outputted to the signal line 54f to set a state which
uses the V.27 ter, V.29 or V.17 modulator 26.

In the step S84, the signal level '0' is
outputted to the signal line 54g to set a state which
does not use the V.34 modulator 28.

10 In a step S86, the signal level '0' is
outputted to the signal line 54h to set a state in
which the decoder circuit 42 receives the information
on the signal line 38a.

15 In a step S88 of Fig. 3, the signal level '1'
is outputted to the signal line 54a to turn on the
CML relay 2.

A step S90 represents a pre-protocol based on
V.21.

20 A step S92 executes image transmission in
accordance with V.27 ter, V.29 or V.17.

A step S94 executes a post protocol based on
V.21.

In a step S96, the signal level '1' is outputted
to the signal line 54a to turn on the CML relay 2.

25 A step S98 executes a pre-protocol based on
V.8.

A step S100 executes image transmission in

1 accordance with V.34. A Q·PSK protocol is executed
between pages.

A step S102 executes a post protocol in
accordance with Q·PSK.

5 In accordance with the Embodiment 1, the
communication system of the calling station is stored
in the memory circuit 46 in association with the
telephone number between call signals which allows
the identification of the telephone number of the
10 calling station prior to the line connection, the
telephone number between call signals is detected
before the line connection, the communication system of the calling station for the detected telephone
number is read from the memory circuit 46, the
15 communication system of its own apparatus is set to be
compatible to the communication system of the calling station before the line connection, and the communication is started. Thus, in the apparatus having a
plurality of totally different communication systems
20 such as the communication system based on V.27 ter,
V.29 and V.17 and the communication system based on
V.34, the pre-protocol with the calling station can
be shortened and the communication cost can be reduced.

A (In the apparatus having the totally different
25 communication systems, normally, the predetermined
pre-protocols are sequentially executed for each
communication system to detect the communication

1 system of the calling station, and the pre-protocol
time is long.)

Further, a chance to misrecognize the communication system of the calling station is reduced.

5 [Embodiment 2]

In the above embodiment, when the detected telephone number between call signals is not registered in the circuit 46, or when the telephone number is not sent between call signals, the pre-protocol based on 10 V.8 may be executed and the image transmission by V.27 ter, V.29 or V.17 or the image transmission by V.34 may be determined in accordance with the ability of the calling station.

A specific example of the above control is 15 shown in Fig. 4 for those portions which are different from the flow charts of Figs. 2 and 3.

In the decision in the step S76 of Fig. 2 is YES, the process proceeds to a step S112.

In the step S112, the information on the 20 signal line 12a is received and whether the telephone number is present between call signals and the detected telephone number is registered in the circuit 46 or not is determined. If YES, the process proceeds to the step S80 of Fig. 2, and if NO, the process 25 proceeds to a step S116.

In a step S116, the signal level '1' is outputted to the signal line 54a to turn on the CML

1 relay 2, that is, connect the signal lines 2a and 2b
to the signal lines 14a and 14b.

A step S118 executes a pre-protocol based on
v.8. The communication system of the calling station
5 is determined based on the signal received in the V.8
pre-protocol.

In a step S120, whether the V.34 function is
equipped or not is determined. If it is equipped,
the process proceeds to the step S100 of Fig. 3 to
10 execute the image transmission by V.34, and if it is
not equipped, the process proceeds to the step S82 of
Fig. 2.

In accordance with the Embodiment 2, if the
telephone number between call signals is not sent or
15 the telephone number of the calling station is not
registered, the communication by V.8 is executed so
that the communication can be shifted to any communica-
tion system. Thus, a case in which the communication
with the calling station is not established because
20 the communication system is not identified before the
line connection is avoided.

[Embodiment 3]

In the above embodiment, when a call is
received from the telephone number between call
25 signals for the first time, the communication may be
executed by the communication system which allows any
communication system because the mode of the calling

A 1 station is not known, and that communication system is stored, and when a predetermined time is elapsed or a predetermined call reception circuit operates, the communication system is again determined for the same A 5 calling station and it is stored.

A specific example of the above control is shown in Figs. 5 and 6 for those portions which are different from the flow charts of Figs. 2 and 3.

When the decision in the step S76 of Fig. 2 is 10 YES, the process proceeds to a step S132.

In the step S132, the information on the signal line 12a is received and whether the telephone number between call signals is sent or not is determined. If it is sent, the process proceeds to a 15 step S136, and if it is not sent, the process proceeds to the step S116 of Fig. 4.

In the step S136, whether the telephone number between call signals is registered in the circuit 46 or not is determined. If it is registered, the process 20 proceeds to a step S152, and if it is not registered, the process proceeds to a step S138.

In the step S138, the signal level '1' is outputted to the signal line 54a to turn on the CML relay 2, that is, connect the signal lines 2a and 2b 25 to the signal lines 14a and 14b.

A step S140 executes a pre-protocol based on V.8. In the V.8 pre-protocol, the communication

1 system of the calling station is determined.

In a step S142, whether the V.34 function is equipped or not is determined, and if it is equipped, the process proceeds to a step S144. If it is not 5 equipped, the process proceeds to a step S146.

In the step S144, the communication system by V.8 or V.34 in association with the detected telephone number between call signals is registered.

In the step S146, the communication system by 10 V.21, V.27 ter, V.29 or V.17 in association with the detected telephone number between call signals is registered in the circuit 46.

In a step S148, the date of registration in association with the detected telephone number between 15 call signals is stored in the circuit 48 and a reception counter in the circuit 50 is cleared. Then, the process proceeds to the step S80 of Fig. 3.

In a step S152 of Fig. 6, the information in the circuit 48 is read to determine whether the 20 telephone number between call signals has elapsed one half year from the registration date or not. If it ^{has} ~~is~~, the process proceeds to a step S138, and if it ~~is~~ ^{has} ~~not~~, the process proceeds to a step S154.

In the step S154, the information in the 25 circuit 50 is read to determine whether the telephone number between call signals has been received over 200 time or not. If it ^{has} ~~is~~, the process proceeds to a step A A

A 1 S138, and if it ^{has} _{is} not, the process proceeds to a step
S156.

In the step S156, the reception counter is incremented by one in association with the detected telephone number between call signals and it is registered in the circuit 50. Then, the process proceeds to the step S80 of Fig. 2.

The process proceeds from the step S70 of Fig. 2 to the step S76 of Fig. 2 and the steps S72 and S74 are not executed.

In accordance with the Embodiment 4, the communication system by V.8 which permits the shift to any communication system is set for the first communicating calling station to prevent the occurrence of communication error due to incompatibility of the communication system with the calling station at the first communication.

A Further, since the communication system which resulted in the successful communication with the calling station is stored in association with the telephone number of the calling station, the communication system can be established before the line connection at the next communication with that calling station and the pre-protocol time is shortened and the communication cost is reduced.

[Embodiment 4]

In the Embodiment 3, when calling is selected

1 for the telephone number information having the
information
communication system^A of the calling station stored in
association with the telephone number information.
between call signals, that communication system^A may
information
5 be stored.

A specific example of the above control is shown in Fig. 7 for those portions which are different from the control flow charts of Figs. 5 and 6.

In the Embodiment 4, the process proceeds from the step S78 of Fig. 2 to a step S166.

In the step S166, whether calling has been selected or not is determined. If it is selected, the process proceeds to a step S168, and if it is not selected, the process proceeds to the step S62 of Fig. 2.

In the step S168, a designated station is called.

In a step S170, the signal level '1' is outputted to the signal line 54a to turn on the CML relay 2.

In a step S172, whether the designated station is registered in the circuit 46 or not is determined. If it is registered, the process proceeds to a step S174, and if it is not registered, the process

The step S174 executes a pre-protocol. When the V.8 pre-protocol signal from a called station is

1 to be detected, the V.8 pre-protocol is executed, and when the V.21 protocol signal from the called station is to be detected, the V.21 pre-protocol is executed.

5 In a step S176, the image transmission is executed. The image is transmitted by the communication system (V.27 ter, V.29, V.17 or V.34) determined in the pre-protocol.

A step S178 executes a post protocol.

10 In a step S180, the signal level '0' is outputted to the signal line 54a to turn off the CML relay 2.

In a step S182, whether the image transmission was by V.34 or not is determined, and if it was, the process proceeds to a step S184, and if it was by V.27 ter, V.29 or V.17, the process proceeds to a step S186.

The step S184 is same as the step S144 of Fig. 5, the step S186 is same as the step S146 of Fig. 5, and the step S188 is same as the step S148 of Fig. 5.

20 The process proceeds from the step S188 to the step S62 of Fig. 2.

In accordance with the Embodiment 4, when the call is made to the station registered in the circuit 46, the communication system used for the communication information is stored in the circuit 46 in association with the communicated station after the completion of the communication. Thus, the content of the circuit 46 is

1 updated at the transmission and the calling station can rapidly conform to the change of function by the updating of the called station.

[Embodiment 5]

5 In the Embodiment 4, when the call is selected,
the communication system^{information} may be stored even for the
telephone number information having the communication
system^{information} of the called station not stored, in accordance
with the telephone number information between call
10 signals.

A specific example of the above control is shown in Fig. 8 for those portions which are different from the control flow chart of Fig. 7.

The process proceeds from the step S170 of Fig. 15 7 to a step S174.

In accordance with the Embodiment 5, when the call is made to the station, not stored in the circuit 46, the communication system used in the communication with the called station is stored in association with the telephone number information of the called station after the completion of the communication. Thus, once called, the communication system is automatically stored in the circuit 46 and an operator time is saved.

In the embodiments described above, as the
information
25 communication system_A (communication protocol) which is
previously stored in association with the telephone
number of the calling station received at the time of

1 reception of call, V.21, V.27 ter, V.29 and V.17 (G3
T.30 protocol) and V.8 and V.34 (high speed protocol)
have been discussed. However, the protocols to be
registered are not limited to those but the protocols
5 of G1, G2, G3, G4, V.8 and V.34 may be added, or the
communication protocols of teletex, telex and computer
communication in addition to the facsimile apparatus
may be added.

It should be understood that the present
10 invention is not limited to the above embodiments ~~but~~^{and that}
various modifications may be made.

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